

PURCHASE DESCRIPTION

VHF/UHF SYNTHESIZED SIGNAL GENERATOR (0.5 to 1024 MHz)

GEBJC-C

- 1.0 GENERAL DESCRIPTION This procurement requires a solid-state, signal generator covering the frequency range of 0.5 to 1024 MHz; output level continuously adjustable from +13 to -127 dBm; CW operation, internal AM/FM and external AM/FM and Pulse modulation capabilities.
- 2.0 CLASSIFICATION The equipment shall meet the requirements of MIL-T-28800( ), Type III, Class 5, Style E, Color R for Navy shipboard, submarine, and shore applications with the following modifications and exceptions:
- a. The Electromagnetic Interference requirements of MIL-T-28800( ) are limited to CE01, CE03 (150 kHz to 50 MHz narrowband and 600 kHz to 50 MHz wideband), CS01, CS02 (0.05 to 100 MHz), CS06, RE01 (relaxed 20 dB; back panel search excluded), RE02 (14 kHz to 10 GHz), and RS03.
  - b. The warm-up time is extended to two hours.
- 3.0 OPERATIONAL REQUIREMENTS The equipment shall be capable of generating signals within the parameters and accuracies specified herein.
- 3.1 Frequency Characteristics (where F = RF output frequency; L = output level)
- 3.1.1 Range: At least 0.5 to 1024 MHz
  - 3.1.2 Resolution: 1 Hz
  - 3.1.3 Accuracy: Same as time base
  - 3.1.4 Stability: (After 2 hour warmup)
    - 3.1.4.1 Internal Standard: < 5 pp 10%/h (at 25°C ±5°C after warmup)
    - 3.1.4.2 External Standard: stability of external standard
    - 3.1.4.2.1 Input Freq: Accepts either 5 or 10 MHz inputs
    - 3.1.4.2.2 Level: > 0.5 vrms and < 2.0 vrms
    - 3.1.4.3 Standard Output: 10 MHz into 50 Ω; level ≥ 0 dBm nominal; BNC female connector
    - 3.1.4.4 Temperature: < 10 ppm (0 to 50°C)
  - 3.1.5 Spectral Purity (Equal to or better than limits specified below)
    - 3.1.5.1 Harmonics/Sub-Harmonics: <-30 dBc [L < +7 dBm]
    - 3.1.5.2 Non-harmonics/Spurious: < -100 dBc [> ±15 kHz of F]
    - 3.1.5.3 Power Line Spurious: < -40 dBc [< ±15 kHz of F]
    - 3.1.5.4 Phase Noise: (Measured in 1 Hz BW at 20 kHz offset from carrier)
      - 3.1.5.4.1 At least -130 dBc/Hz [F < 512 MHz]
      - 3.1.5.4.2 At least -124 dBc/Hz [F > 512 MHz]
    - 3.1.5.5 Residual FM: < 20 Hz rms [50 Hz to 15 kHz bandwidth]
    - 3.1.5.6 Residual AM: < -80 dBc [50 Hz to 15 kHz bandwidth]
  - 3.1.6 Sweep (Digital)
    - 3.1.6.1 Range: 1 to 1024 MHz
    - 3.1.6.2 Step Size: At least 1 kHz to 100 MHz
    - 3.1.6.3 Step Rate: At least 1 step/40 ms to 1 step/s
- 3.2 Output Characteristics

- 3.2.1 Range: +13 to -127 dBm
- 3.2.2 Accuracy: (Indicated output level vs externally measured level)  
±1.5 dB (+13 to -117 dBm) ±3 dB (-117 to -127 dBm)
- 3.2.3 Flatness: (Output variation measured at +10 dBm)  
±1.0 dB (peak-peak variation ≤ 2 dB)
- 3.2.4 Display (digital): Output level selectable in units of either power (dBm) or volts into 50 Ω
- 3.2.4.1 Resolution: At least 0.1 dB
- 3.2.5 Output Impedance: 50 ohms nominal
- 3.2.6 Connector: Type-N female
- 3.2.6.1 VSWR < 1.5:1 for output levels ≤ -10 dBm
- 3.2.6.2 VSWR < 2.5:1 for output levels > -10 dBm
- 3.2.7 Reverse Power Protection:  
Resettable RF circuit breaker capable of withstanding inputs up to 50 watts
- 3.3 Modulation Characteristics
- 3.3.1 Sources: 2 separate  
Both synthesized
- 3.3.1.1 Frequency Range/Waveform: 10 Hz to 100 kHz / sinewave
- 3.3.1.1.1 Resolution: At least 1 Hz
- 3.3.1.2 Level: Adjustable, at least 0 to 1 Vrms
- 3.3.1.3 Impedance: 600 Ω ±10%
- 3.3.1.4 Outputs: At least one source
- 3.3.1.5 Control: At least one source via front panel / second source via special functions
- 3.3.1.6 Distortion: < 0.5% at 1 Vrms for frequency < 15 kHz
- 3.3.2 Amplitude Modulation (AM) (where F = RF output frequency)
- 3.3.2.1 Internal AM
- 3.3.2.1.1 Rate (3 dB Bandwidth):
- 3.3.2.1.1.1 Variable 10 Hz to 5 kHz (0.5 MHz < F < 8 MHz)
- 3.3.2.1.1.2 Variable 10 Hz to 10 kHz (8 MHz < F < 128 MHz)
- 3.3.2.1.1.3 Variable 10 Hz to 100 kHz (F > 128 MHz)
- 3.3.2.1.2 Depth: 0 to 99% (levels ≤ 0 dBm)
- 3.3.2.1.2.1 Display / Resolution: Digital 0-99% with 1% resolution
- 3.3.2.1.2.2 Accuracy: ±7% (Measured vs indicated depth at 1 kHz)
- 3.3.2.1.3 Distortion: < 5% (50% depth @ 1 kHz rate)
- 3.3.2.1.4 Incidental FM: <200 Hz (50% depth @ 1 kHz rate)
- 3.3.2.2 External AM
- 3.3.2.2.1 Rates (3 dB Bandwidth):
- 3.3.2.2.1.1 Variable 10 Hz to 5 kHz (0.5 MHz < F < 8 MHz)
- 3.3.2.2.1.2 Variable 10 Hz to 10 kHz (8 MHz < F < 128 MHz)
- 3.3.2.2.1.3 Variable 10 Hz to 100 kHz (F > 128 MHz)
- 3.3.2.2.2 Depth: 0 to 99%
- 3.3.2.2.3 Distortion: < 5% (50% depth @ 1 kHz rate)
- 3.3.2.2.4 Sensitivity: 1 V<sub>peak</sub> into 600 Ω produces depth selected within ±10%.
- 3.3.3 Frequency Modulation (FM)

- 3.3.3.1 Internal FM
  - 3.3.3.1.1 Rate: At least 10 Hz to 100 kHz
  - 3.3.3.1.2 Deviation: (1 and 10 kHz rates)
    - 3.3.3.1.2.1 At least 0 to 1 kHz ( $F < 1$  MHz)
    - 3.3.3.1.2.2 At least 0 to 10 kHz ( $1 \text{ MHz} < F < 32 \text{ MHz}$ )
    - 3.3.3.1.2.3 At least 0 to 100 kHz ( $32 \text{ MHz} < F < 128 \text{ MHz}$ )
    - 3.3.3.1.2.4 At least 0 to 1 MHz ( $F > 128 \text{ MHz}$ )
  - 3.3.3.1.3 Display/Resolution: Digital, at least 3 digits in kHz
  - 3.3.3.1.4 Accuracy:  $\pm 5\% + 10 \text{ Hz}$  (Measured vs indicated deviation at 1 kHz)
  - 3.3.3.1.5 Distortion:  $< 5\%$  (20 kHz dev @ 1 kHz rate)
  - 3.3.3.1.6 Incidental AM:  $< 1\%$  (100 kHz dev @ 1 kHz rate)

- 3.3.3.2 External FM (same as 3.3.3.1 Internal FM except as noted below)
  - 3.3.3.2.1 Rate: At least dc to 100 kHz
  - 3.3.3.2.2 Sensitivity: 1 V<sub>peak</sub> into 600  $\Omega$  produces desired deviation within  $\pm 10\%$ .
  - 3.3.3.2.3 Input impedance: 600 ohms  $\pm 10\%$

#### 3.3.4 External Pulse Modulation (for outputs above 10 MHz)

- 3.3.4.1 Rate (PRF): At least 50 Hz to 50 kHz
- 3.3.4.2 Pulse Width (PW) (minimum):  $< 1 \mu\text{s}$
- 3.3.4.3 ON/OFF Ratio: Greater than 40 dB
- 3.3.4.4 Rise/Fall Time:  $< 1 \mu\text{s}$

### 4.0 GENERAL REQUIREMENTS

- 4.1 Power: 115/230 Vac  $\pm 10\%$  single phase, 50, 60 or 400 Hz, 400 VA maximum
- 4.2 Dimensions: The total volume shall not exceed 47,050 cm<sup>3</sup> (2893 in<sup>3</sup>).
- 4.3 Weight: The overall weight of the unit shall be nominally less than 27.3 kg (60 lb).
- 4.4 Calibration Interval: The calibration interval shall be 12 months minimum. The equipment shall be within all accuracy requirements specified herein, with a 72% or greater confidence factor following a calibration interval of 12 months.
- 4.5 Remote Operation: The unit will be capable of remote operation via IEEE-488( ) bus interface. It shall operate as a talker or listener such that all functions except the power on/off switch are controllable and shall have as a minimum the following subset of GPIB commands: AH1, SH1, T6, L4, SR1, RL1, DC1, DT1.